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THE UNIVERSITY OF CHICAGO

DATE December 28, 1943

TO C. F. Hiskey

DEPARTMENT

MUC-CFH-31

FROM Bernard Barash

DEPARTMENT

This document consists of 3 pages and 0 figures

IN RE: Bloomington Experiments

No. 1 of 3 copies, Series A

Left Chicago on Sunday, December 12, for Bloomington, Indiana, where I was to work in conjunction with Dr. Mitchell. Carried along approximately 1200 grams of D_2O.

On Monday, December 13, some necessary equipment arrived from Chicago, was unpacked, and made ready for use. A large dry box had been constructed for purposes of D_2O handling and it was set up for operation.

On Tuesday, experiments were begun. Several slurries were made up using analyzed, micronized UO_2 and light water. This latter was employed for two reasons. First, it served as a good means of perfecting the technique of handling liquid and slurries in the dry box; secondly, Dr. Mitchell was interested in determining the results for light water and comparing them with those of previously used UO_2 mixtures with sugar and carbon and those to be obtained with D_2O.

Barring poor results, four light slurries and four heavy slurries were to be run with light water; four light slurries and four heavy slurries were to be run with heavy water.

A series of light slurries was first run off. In these the proportion in grams of UO_2:H_2O:$CdSO_4$ was 1.0:2.62:0.147, respectively. Two slurries were run off on Tuesday and one more on Wednesday morning. These first three failed to check and in endeavoring to determine where the error lay it was decided that the monitors may not have been placed in the same positions on the cylinders for each of the runs. A definite position was then chosen on each cylinder and four more runs were made on Wednesday afternoon and Thursday. These checked well and also with the third one.

Four heavy slurries were run and calculated on Friday and Saturday. The proportion in grams of UO_2:H_2O:$CdSO_4$ in these was 1.0:0.549:0.147, respectively. These gave good results.

In all of these slurries fresh, distilled water was used for each preparation. In the heavy water slurries the D_2O of each slurry was to be derived from the D_2O decanted from the last slurry after irradiation. Two runs were, therefore, made on Sunday to determine whether the results were altered by the slight amount of UO_2 remaining suspended in the decanted water. The water decanted from the fourth heavy water slurry was used for the first of these and the water decanted from this one was used for the second. In each case a little additional H_2O had to be added to make up for the small amount

retained by the UO_2 mud. Both of these runs checked closely with those done with fresh water, thus justifying the use of decanted D_2O in experiments to follow.

On Monday experiments using D_2O were begun. A stock solution containing 850 grams of D_2O and 20.83 grams $CdSO_4$ was prepared, for the proportion of D_2O to $CdSO_4$ in grams in all of the D_2O slurries was to be 1.0: .0245. To insure complete dehydration of the $CdSO_4$, it was baked at 115° C. 108° C is the temperature of transition to the anhydrous form. Before use each day the dry box was evacuated with a vacuum pump while oxygen passed through drierite was passed in at the rate of 10-12 liters per minute. This "flushing" operation was continued for fifteen minutes and during all operations involving the dry box oxygen was run into it at the rate of 10 liters per minute.

Four runs employing light slurry were made on Monday and Tuesday A.M. The proportion in grams of UO_2:D_2O:$CdSO_4$ was 1.0:2.62: .0245. The results on these checked very closely, and the four heavy slurries were made up and run on Tuesday afternoon and Wednesday morning. The proportion in grams of UO_2:D_2O:$CdSO_4$ in these was 1.0:0.549:0.0245 respectively. The results of these runs are now being calculated and a preliminary statement has been made to the effect that they check.

In all cylinders an air space was allowed to permit for better agitation and maintenance of slurry homogeneity during rotation. For the light slurries this air space was about 3% of the volume of each cylinder. For the heavy slurries it was about 11% of the volume of each cylinder. The fact that the results check is a good indication that little settling occurred during irradiation as the cylinders were being rotated. This was observed, too, when the cylinder contents were poured off after each run. Very little UO_2 had collected on the walls.

My personal job in the experiments was to prepare the slurries in proper proportions, put them into the boxes, screw the boxes closed, suggest the necessary length of time of rotation before irradiation to insure homogeneity, pour off the contents after irradiation, centrifuge the mixture and decant the liquid after centrifugation, do all handling of D_2O, and take all samples. The separation and purification was done by a member of Dr. Mitchell's staff. I assisted also in reading the counters and tabulating the figures.

As much of the wet UO_2 was saved as possible to allow for maximum recovery of the D_2O. Also approximately 350 grams of unused D_2O was returned together with the D_2O - $CdSO_4$ - UO_2 decanted mixture.

Samples taken and the numbers assigned to them are as follows:

1. Sample of starting D_2O
2. Sample of D_2O from middle box after fourth run heavy slurry
3. Sample of D_2O from middle box after first run light slurry
4. Sample of D_2O from middle box after fourth run light slurry
5. Sample of D_2O from middle box after first run heavy slurry
6. Sample of D_2O from large cylinder after fourth run heavy slurry
7. Sample of D_2O from middle box after second run heavy slurry
8. Sample of D_2O from middle box after third run heavy slurry

Returned to Chicago on Thursday, December 23rd.